

## CLAIMS

What is claimed is:

- 5 1. An arrangement for flushing a toilet of the type that comprises a toilet bowl and a toilet tank operatively coupled to the toilet bowl, wherein the toilet tank has a flush valve which provides a conduit for water to flow from the toilet tank to the toilet bowl when the toilet is flushed, wherein the flush valve includes a valve seat and a pivotable flush valve flapper which opens and closes the valve, wherein the arrangement comprises:
  - 10 a flush valve flapper lifting assembly, positioned in the toilet tank, for pivoting the flush valve flapper from its closed position to its open position in response to a flush signal;  
a handle assembly comprising a manually actuatable handle, operatively coupled to the flush valve flapper lifting assembly, for providing the flush signal to the flush valve
  - 15 flapper lifting assembly;  
wherein the handle assembly transmits the flush signal to the flush valve flapper lifting assembly in response to manual actuation of the handle.
2. The arrangement as claimed in claim 1, wherein the handle assembly detects
- 20 manual actuation of the handle.
3. The arrangement as claimed in claim 1, wherein the handle assembly comprises a switch for detecting manual actuation of the handle.
- 25 4. The arrangement as claimed in claim 1, wherein the handle assembly comprises means for detecting manual actuation of the handle.
5. The arrangement as claimed in claim 1, including a wire for electrically coupling the handle assembly to the flush valve flapper lifting assembly, wherein the flush signal is
- 30 transmitted from the handle assembly to the flush valve flapper lifting assembly via the wire.
6. The arrangement as claimed in claim 1, wherein the handle assembly comprises a

transmitter for transmitting the flush signal to the flush valve flapper lifting assembly and the flush valve flapper lifting assembly comprises a receiver for receiving the flush signal transmitted by the handle assembly.

5     7.     The arrangement as claimed in claim 6, wherein the flush signal is transmitted by the transmitter of the handle assembly to the receiver of the flush valve flapper lifting assembly by one of IR, PIR, RF, light or sonar.

10     8.     The arrangement as claimed in claim 3, wherein the switch is comprised of an assembly that one of (i) operates by the detection or changing of a magnetic field, (ii) is operated by a switch position change, (iii) that comprises a coil plunger core arrangement operating signal, (iv) that uses a magnet in conjunction with a Hall-effect transistor, or (v) utilizes a circuit capacitance change.

15     9.     The arrangement as claimed in claim 1, wherein the handle assembly comprises at least one sensor for detecting the presence of a user in a target area.

20     10.    The arrangement as claimed in claim 9, wherein the flush signal is transmitted by the handle assembly to the flush valve flapper lifting assembly after the user has exited the target area.

25     11.    The arrangement as claimed in claim 9, wherein the at least one sensor comprises:  
a transmitter for emitting at least one radiation beam to the target area; and  
a detector being responsive to a reflected radiation beam emitted from the radiation  
beam transmitter and reflected off of a user in the target area.

30     12.    The arrangement as claimed in claim 11, wherein the handle assembly comprises a controller that is responsive to a signal from the detector that is indicative of the intensity of the reflected beam.

13.    The arrangement as claimed in claim 12, wherein the controller transmits the flush signal to the flush valve flapper lifting assembly depending on the signal transmitted from the detector.

14. The arrangement as claimed in claim 9, wherein the flush valve lifting assembly commences a flushing upon receipt of the flush signal from the handle assembly.

15. The arrangement as claimed in claim 1, wherein the flush valve lifting assembly  
5 comprises:

a motor;

a flush valve flapper lifter, operatively coupled to the motor, for causing the pivoting of the flush valve flapper from its closed position to its open position during the flushing.

10

16. The arrangement as claimed in claim 15, including a gear train assembly comprising at least one gear operatively coupled to the motor, and wherein the flush valve flapper lifter is operatively coupled to the gear train assembly;

17. wherein the operation of the motor results in the rotation of the at least one gear  
15 thus causing the flush valve flapper lifter to pivot the flush valve flapper from its closed position to its open position.

17. The arrangement as claimed in claim 1, wherein the handle assembly is mounted on a sidewall of the toilet tank.

20

18. The arrangement as claimed in claim 17, wherein the toilet tank comprises an aperture through which a handle is mountable, and wherein the handle assembly is secured to the tank through the aperture.

19. The arrangement as claimed in claim 1, wherein the flush valve flapper lifting assembly is coupled to an overflow tube positioned in the toilet tank.

25

20. The arrangement as claimed in claim 19, wherein the underside of the flush valve flapper lifting assembly comprises one or more spaced apart holes or channels to which the  
30 overflow tube is coupled.

30

21. The arrangement as claimed in claim 1, including at least one elongated flange coupled to the flush valve lifting assembly, for supporting the flush valve lifting assembly on

a rim of the toilet tank, wherein the flange is slideably adjustable;

whereby the position of flush valve lifting assembly in the tank toilet is adjustable.

22. The arrangement as claimed in claim 1, including at least one leg coupled to the flush  
5 valve lifting assembly, for supporting the flush valve lifting assembly in the toilet tank,  
wherein the at least one leg is lengthwise adjustable;

whereby the position of flush valve lifting assembly in the tank toilet is adjustable.

23. A flush valve actuation arrangement for replacing a flushing assembly of the type  
10 used for flushing a toilet of the type that comprises a toilet bowl and a toilet tank  
operatively coupled to the toilet bowl, wherein the toilet tank has a flush valve which  
provides a conduit for water to flow from the toilet tank to the toilet bowl when the toilet  
is flushed, wherein the flush valve includes a valve seat and a pivotable flush valve flapper  
which opens and closes the valve, wherein the flush valve actuation assembly comprises:

15 a handle assembly that comprises at least one sensor for detecting the presence of a  
user in a target area; and

a flush valve flapper lifting assembly, operatively coupled to the housing assembly  
and positioned in the toilet tank, for pivoting the flush valve flapper from its closed  
position to its open position in response to a flush signal;

20 wherein the housing assembly transmits the flush signal to the flush valve flapper  
lifting assembly; and

wherein the toilet tank comprises an aperture through a sidewall through which a  
conventional handle, comprising a lift arm to lift a conventional chain to pivot a  
conventional flush valve flapper, is mountable, and wherein the handle assembly is  
25 secured to the toilet tank through the aperture.

24. The arrangement as claimed in claim 23, wherein the handle assembly comprises a  
stem that is passable through the aperture in the sidewall of the toilet tank, and wherein the  
handle assembly comprises a stem securer for securing the handle assembly on the  
30 sidewall of the toilet tank.

25. The arrangement as claimed in claim 23, wherein the stem is threaded and the stem  
securer is threadably coupled to the stem to secure the handle assembly on the sidewall of

the toilet tank.

26. The arrangement as claimed in claim 25, wherein the stem securer is positioned on the inside of the toilet tank when the handle assembly is secured to the toilet tank.

5

27. The arrangement as claimed in claim 23, wherein the handle assembly comprises a manually actuatable handle, operatively coupled to the flush valve flapper lifting assembly, for providing the flush signal to the flush valve flapper lifting assembly;

wherein the handle assembly transmits the flush signal to the flush valve flapper lifting assembly in response to manual actuation of the handle.

10

28. The arrangement as claimed in claim 27, wherein the handle assembly detects manual actuation of the handle.

29. The arrangement as claimed in claim 23, including a wire for electrically coupling the handle assembly to the flush valve flapper lifting assembly, wherein the flush signal is transmitted from the handle assembly to the flush valve flapper lifting assembly via the wire.

15

30. The arrangement as claimed in claim 23, wherein the handle assembly comprises a transmitter for transmitting the flush signal to the flush valve flapper lifting assembly and the flush valve flapper lifting assembly comprises a receiver for receiving the flush signal transmitted by the handle assembly.

20

31. The arrangement as claimed in claim 23, wherein the at least one sensor comprises: a transmitter for emitting at least one radiation beam to the target area; and a detector being responsive to a reflected radiation beam emitted from the radiation beam transmitter and reflected off of a user in the target area.

25

32. The arrangement as claimed in claim 23, wherein:  
the handle assembly comprises a controller that is responsive to a signal from the sensor that is indicative of the intensity of the reflected beam;  
the controller transmits the flush signal to the flush valve flapper lifting assembly

30

depending on the signal transmitted from the sensor; and

the flush valve lifting assembly commences a flushing upon receipt of the flush signal from the at least one sensor.

5     33.     A handle assembly to be mounted on a sidewall of a toilet tank of a toilet, the toilet being of the type that comprises a toilet bowl and a toilet tank operatively coupled to the toilet bowl, wherein the toilet tank has a flush valve which provides a conduit for water to flow from the toilet tank to the toilet bowl when the toilet is flushed, wherein the flush valve includes a valve seat and a pivotable flush valve flapper which opens and closes the  
10     valve, and a flush valve flapper lifting assembly, positioned in the toilet tank, for pivoting the flush valve flapper from its closed position to its open position in response to a flush signal, wherein the handle assembly comprises:

        a manually actuatable handle, operatively coupleable to the flush valve flapper lifting assembly, for providing a flush signal to the flush valve flapper lifting assembly;

15     wherein the handle assembly transmits the flush signal to the flush valve flapper lifting assembly in response to manual actuation of the handle.

34.     The assembly as claimed in claim 33, including a wire for electrically coupling the handle assembly to the flush valve flapper lifting assembly, wherein the flush signal is  
20     transmitted from the handle assembly to the flush valve flapper lifting assembly via the wire.

35.     The assembly as claimed in claim 33, wherein the handle assembly comprises a transmitter for transmitting the flush signal to the flush valve flapper lifting assembly and  
25     the flush valve flapper lifting assembly comprises a receiver for receiving the flush signal transmitted by the handle assembly.

36.     The assembly as claimed in claim 33, wherein the handle assembly comprises:  
        a switch for detecting manual actuation of the handle; and  
30     at least one sensor for detecting the presence of a user in a target area.

37.     The assembly as claimed in claim 36, wherein the flush valve lifting assembly commences a flushing upon receipt of the flush signal from the handle assembly.

38. The arrangement as claimed in claim 37, wherein the handle assembly is mounted on a sidewall of the toilet tank and wherein the toilet tank comprises an aperture through which a handle is mountable, and wherein the handle assembly is secured to the tank through the aperture.

5

39. The assembly as claimed in claim 38, wherein the handle assembly comprises a stem that is passable through the aperture in the sidewall of the toilet tank, and wherein the handle assembly comprises a stem securer for securing the handle assembly on the sidewall of the toilet tank.

10